



COMMERCIAL & INDUSTRIAL HVAC EQUIPMENT

OPERATING AND SERVICE MANUAL

--DO NOT REMOVE FROM EQUIPMENT--

SERIAL NUMBER:

For technical service or repair,

FIRST CALL - INSTALLING CONTRACTOR:

SECOND CALL:

FINAL CALL: Titan Air LLLP - (715) 597-2050

Please have serial number available when calling

MANUFACTURED BY:

Titan Air LLLP

13901 16th Street - P.O. Box 717

Osseo, WI 54758 - Phone 715-597-2050



WARNING

Improper installation, adjustment, alteration, service or maintenance can cause property damage, injury or death. **READ** all maintenance instructions thoroughly before installing or servicing equipment.



CAUTION

FOR YOUR SAFETY

If you smell gas:

1. Open windows.
2. **DO NOT** touch electrical switches.
3. Extinguish any open flame.
4. Immediately call your gas supplier.

The use and storage of gasoline or other flammable vapors and liquids in open containers in the vicinity of this heater is **HAZARDOUS**.

NOTICE

LOW TEMPRATURE LIMT

If this heater is to be installed in an area of potential freeze up and a low temperature limit was not ordered, one should be installed to provide freeze protection in the event of a burner shut down.

INFORMATION

LIGHTING INSTRUCTIONS

A. This appliance is equipped with an electronic ignition device which automatically lights the burner. **DO NOT** attempt to light burner by hand.

B. Before operating appliance, check immediate area for the smell of gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.

C. **DO NOT** operate appliance if any part has been submerged in water. Immediately call a qualified service technician to inspect the appliance and replace any components which were under water.

Start-Up

1. Read all safety material included with this unit.
2. Turn thermostat or temperature controller to its lowest setting.
3. Turn off gas supply at the main manual shut-off valve.
4. Switch off power to the unit, at the disconnect switch.
5. Ensure all gas valves are in the normally closed position.
6. Wait 5 minutes for gas to clear out. Check and repair any gas leaks before proceeding to the next step.
7. Open all manual gas valves and reset low gas pressure switch, if supplied.
8. Switch power back on at the unit disconnect.
9. Set thermostat or temperature controller to desired temperature to initiate a call for heat.
10. The burner motor should start for a pre-purge period determined by unit flame safeguard control.
11. After completion of the pre-purge period the ignition process should begin.

Shutdown

1. Repeat steps 2 through 5, above, for unit shutdown.

NOTICE

APPLICATION / OPERATION INSTRUCTIONS

This heater is for operation at a temperature rise from 20°F to 100°F and is also satisfactory for use downstream from refrigeration systems.

1-14-101-09 (03/13)

NOTICE

For outdoor equipment with a variable frequency drive (VFD) factory mounted in the unit, main power should remain on at all times especially during cold weather. Even if the unit will not run at night or over a weekend, main power should remain on to allow internal VFD self-heating which extends VFD service life.



24 MONTH WARRANTY

24 MONTH WARRANTY

Titan Air hereby warrants its products against defects in material and workmanship for a period of (24) twenty four months from date of shipment.

Start up checklist is due back within (30) thirty days of start-up or 120 days from date of delivery for 24 month warranty to be effective. After (30) thirty days, and up until (60) sixty days, a (13) thirteen month warranty will be observed. All warranties are null and void if start up checklist is not received within (60) sixty days from start-up or 120 days from date of delivery. **NO EXCEPTIONS WILL BE MADE.**

Titan Air reserves the right at Titan Air's option, to replace or repair free of charge, any part proven by Titan Air to be defective. Prompt notification of defective part must be given to Titan Air and defective part must be returned freight prepaid within (30) thirty days of notification.

WARRANTY INCLUDES ONLY PARTS SUPPLIED BY TITAN AIR. INCIDENTAL COSTS AND LABOR CHARGES SHALL BE THE RESPONSIBILITY OF OTHERS. This warranty does not cover fuses, belts, filters, refrigerant or water damaged parts which are the result of improper storage or installation.

This warranty is void in event the product is improperly installed and/or operated under conditions other than normal published ratings, improperly maintained, misused or not in compliance with applicable codes or not in accordance with Titan Air's operating instructions.

This warranty is void if attempts to correct or repair any alleged defective part or parts are made by unauthorized personnel without Titan Air's written approval.

In no event shall Titan Air be held liable for any damage, incidental or consequential, arising from the installation, performance or operation of the product.

This warranty supersedes, voids, and/or is in lieu of any other verbal or written understanding which may not be in total accordance with this expressed warranty.

Warranted parts must be returned to Titan Air within 60 days to receive credit.

Purchased components such as Steam Generators Systems, Electric Coils, Refrigerant Condensers, Chillers, Coils, Heat Exchangers are covered under the original equipment manufacturer's warranty.

The burner and heat exchanger is factory set at safe operating conditions, attempting to over fire the burner can cause damage to the exchanger, reduce its operating life, and void the warranty.

Start up of equipment with power burners are to be done by burner manufacture trained service technicians only for heat exchanger warranty.



24 MONTH WARRANTY

PURPOSE/ APPLICABILITY

This manual is intended to provide installation, operating and service information on Titan Air's TAH-Indirect Fired equipment.

A packet of reference materials for a specific equipment (tracked by its Serial Number) is typically included with this Operating and Service Manual. The reference materials include Equipment Specifications, Parts Lists, Gas Train and Burner Specifications, Electrical Schematic, and a Sequence of Operation. Review the reference materials for a specific equipment and note any optional equipment or controls which are not specifically addressed in this manual prior to attempting start-up or service work

The information and recommendations contained in this publication are based on general observation and are not intended to supplant requirements of federal, state or local codes having jurisdiction. These codes should be reviewed before installation of equipment. All equipment must be installed in accordance with national, state or local codes.

It is the responsibility of the purchaser at the time of order, to specify any and all code or insurance requirements that may dictate the addition of components to the equipment in order to comply with those requirements.

Only qualified personnel who have experience with the installation and operation of industrial/commercial direct fired equipment should attempt to service Titan Air equipment.

Titan Air equipment can be equipped with Hot Water or Steam heating coils, Chilled Water cooling coils, DX cooling coils, and Ammonia cooling coils. These components will be certified by accepted industry standard testing agencies. Hydronic, DX, and ammonia coils will typically be ARI 410 certified.



TABLE OF CONTENTS

GENERAL INFORMATION	PAGE #
24 MONTH WARRANTY	3
PURPOSE/ APPLICABILITY.....	4
EQUIPMENT ARRIVAL	6
STORAGE.....	6
COMPONENTS.....	7
<u>INSTALLATION</u>	
PRE-INSTALLATION	8
HEAT EXCHANGER VENTING.....	8
POSITIONING THE HEATER.....	8
CLEARANCE.....	9
CURBING (OUTDOOR MOUNTING)	9
INSTALLATION SAFETY	9-10
DUCTWORK	10
SOUND AND VIBRATION CONTROL ..	10
WATER, STEAM, & AMMONIA- COIL INSTALLATION	11-12
DISCHARGE TEMP SENSOR BULB INSTALLATION & WIRING	12
FIELD WIRING.....	12
<u>UNIT AND ACCESSORY INSTALLATION</u>	
UNIT & ACCESSORY SUPPORTING OPTIONS.....	13
SECTION ASSEMBLY-HORIZONTAL	14-15
SECTION ASSEMBLY-VERTICAL ..	16-18
ACCESSORY INSTALLATION	19-20
INTAKE DAMPER MOUNTING.....	21
DISCHARGE DAMPER MOUNTING.....	21
VERTICAL DISCHARGE DIFFUSER MOUNTING	22
STEAM COIL- TRAPPING	23
DRAIN PAN- TRAPPING.....	23-24
<u>MAINTENANCE</u>	
GENERAL MAINTENANCE	25
FILTERS	25
BURNER	25
GENERAL V-BELT DRIVE TIPS.....	26-27

BLOWER BEARINGS	28
MOTOR BEARINGS.....	28
BLOWER WHEEL	28
PLATE FINNED COIL CLEANING	29
CONDENSATE TRAP	29
GENERAL START-UP INFORMATION.	30

<u>SPECIFIC EQUIPMENT DETAILS</u>	
.....	pages not numbered
EQUIPMENT SPECIFICATION	
EQUIPMENT DRAWING	
SEQUENCE OF OPERATION	
PARTS/ LEGEND SHEET	
SCHEMATIC	
GAS TRAIN / BURNER SPECIFICATION	
COIL PERFORMANCE REPORTS (IF APPLICABLE)	
START-UP PROCEDURE	
TROUBLESHOOTING (OPTIONAL)	
<u>SUPPLEMENTAL MANUALS</u>	
EVAPORATIVE COOLER (IF APPLICABLE)	

Note that operating and service manuals are occasionally requested prior to production of equipment. These manuals will be marked "Pre-Production Release" on the front cover.

The final copy of the operating and service manual for a specific equipment will be sent with the equipment. Additional copies of the manual for a specific equipment are available.

A detailed equipment specification sheet, parts/legend sheet, schematic, sequence of operation and start-up procedure are provided in the start-up section of each operating and service manual generated for a specific equipment. Selected vendor cut sheets on components will also be included.



EQUIPMENT ARRIVAL

When the air make-up equipment arrives, be sure to inspect for shipping damage. The equipment was thoroughly inspected before leaving the factory. Also upon receipt check the shipment for items which shipped loose such as a remote box and remote sensors. Consult the Bill of Lading to identify the potential shipped loose items. It should be noted that these items may have been placed inside equipment cabinet in multiple locations; however, more often than not, shipped loose items can be found in the blower section of the equipment. Any damaged or missing items should be reported to the transporter immediately. **DO NOT SEND DAMAGED FREIGHT BACK TO TITAN AIR! All claims must be filed with the transporter.** Be sure to take photographs and get the driver's signature to confirm the damage. The driver will have a number for you to call to file a claim. Request a written inspection report from the carrier claims inspector to substantiate any necessary claim. Be sure to open the equipment access doors and inspect for internal damage.

STORAGE

If for some reason you are unable to install the equipment immediately, be sure that the equipment is protected from the elements. Water damaged parts are not covered by Titan Air's warranty. If the equipment is stored for an extended length of time, be sure to completely check the equipment for any internal damage which may have been caused by excessive condensation. Also check for damage caused by rodents, and be sure to eliminate any dust that may have built up on the components while the equipment was in storage.

LONG TERM STORAGE

Please observe the following precautions if the equipment is to be stored for an extended period of time. (NOTICE: The time elapsed during storage still counts against the warranty period.)

- Best place to store the equipment is on a clean level surface, in a dry location where the temperature can be controlled, if possible.
- Isolate equipment from shock and vibration or damage may occur to the stationary blower bearings.
- At least once a month enter the blower vestibule and slowly rotate the blower wheel about 30 times to redistribute the grease inside the bearings to help prevent corrosion from occurring.
- Reduce belt tension by at least 50% or remove belts completely.
- Do not allow coverings to trap moisture against equipment casing.

CAREFULLY AND THOROUGHLY READ TITAN AIR'S PRODUCT WARRANTY

Each equipment is tested at the factory prior to shipping. Because we are not able to simulate exact field conditions and sometimes actual conditions are different than what was stated on the order, you may need to make some adjustments in the field. This is why it is very important that only qualified personnel start-up and service Titan Air equipment. The start-up checklist (provided in packet with this manual) must be filled out and returned to Titan Air in order to validate equipment warranty.

For a fee, Titan Air personnel will travel to the job site, supervise start-up and provide operation and maintenance training for the equipment.



COMPONENTS

BLOWERS

The typical blower(s) used in Titan Air equipment are AMCA rated industrial type forward curve D.W.D.I. fans. Backward incline, backward airfoil, and plenum/plug fans are used occasionally. Models TA-109 through TA-136 utilize a single blower while models TA-215 through TA-242 utilize twin blowers. All blower wheels are mounted on a solid, turned, ground and polished shaft. 9" and 12" blowers are supported with permanently lubricated ball bearings. Larger blowers are supported by relubricatable pillow block ball bearings.

MOTOR & DRIVE

Open drip proof (ODP), rigid base, single speed (1750 rpm) motors mounted on an adjustable base are standard equipment. TEFC, high efficiency, two speed, and other motor options are available. High quality motor starters and electronic overloads with phase loss protection are also standard items.

V-Belt drive assemblies are selected with a 1.5 service factor. Equipment furnished with a supply VFD will typically have a fixed motor sheave. However, some equipment may still utilize a variable pitch motor sheave on motors up to 30 Hp.

INDIRECT FIRED HEATING

BURNER INFORMATION

Titan Air Handlers can be equipped with inshot style burners and heat exchangers or power burners with drum and tube heat exchangers. Both styles of burners and heat exchangers are ETL labeled for indoor and outdoor use. Additional information regarding the indirect fired heating section is included. All equipment with power burners require burner manufacturer trained personnel to perform start up and service.

ELECTRIC /ELECTRONIC CONTROLS

Typically, equipment are equipped with a motor starter and overload, control power transformer (if a 3-wire system), and remote control panel. Discharge or space temperature controls may be provided by Titan Air or may be field supplied. Electric coil heating equipment will be equipped with an airflow switch and temperature limits by the electric duct heater manufacturer.

Numerous standard control packages are available and optional items can be added to these packages. For more information regarding these options, refer to catalog data or contact a local Titan Air Representative.



INSTALLATION

PRE-INSTALLATION

Inspect the equipment making sure that all parts and accessories are accounted for. Check equipment against order and packing list.

If the equipment has been sitting in storage for some time, inspect for moisture and/or dust accumulation. Both can cause damage to electrical components as well as bearings and insulation.

Verify that electric service matches equipment ratings. Verify that heating or cooling medium capacities match associated equipment (boiler, chiller, condensing unit, ...)

INSTALLATION CODES

Care taken during the installation and start-up is vital to the longevity and reliability of the equipment. Confirm that gas and electric utilities match the rating on the equipment name plate.

- This heater shall be installed in accordance with local codes or, in the absence of local code, according to National Fuel Gas Code, ANSI Z223.1/ NFPA 54, or the CAN/ CSA B149.1 Natural Gas and Propane Installation Code.
- If the heater is to be installed in an aircraft hangar, refer to ANSI/NFPA 409.
- If the heater is to be installed in a parking structure, refer to ANSI/NFPA 88A.
- If the heater is to be installed in a service garage, refer to ANSI/NFPA 88B.
- For installations in Canada, refer to CAN/CSA B149.1 National Gas and Propane Installation Codes.
- Gas piping and exhaust venting must be sized and installed to comply with applicable codes and standards.
- If in doubt regarding the application of the heater, contact a sales representative or the factory.

GAS PIPING

Supply gas pressure must be 7" – 14" w.c.

HEAT EXCHANGER VENTING

The National Fuel Gas Code ANSI Z223.1/NFPA 54 specifies a 4 foot horizontal vent terminal clearance from gas and electrical meters, regulators and relief openings. ***Exhaust vent within air handler vestibule needs to be insulated to avoid excessive temperatures within the control cabinet that can cause component failure.*** Refer to Heatco's installation manual for more information.

POSITIONING THE HEATER

Locate the heater exactly level, making certain minimum clearance required by local codes is maintained between the heater and any combustible materials. See name plate on equipment for minimum recommended clearances.

NOTE: If the heater is installed in a garage, it shall be installed with a clearance above the floor of 18 inches.

When the air handler equipment is located on a roof or at ground level on a concrete pad, the equipment intake needs to be a minimum of 24" above the roof and/ or ground to prevent the intake of snow or splashed rain. The equipment should be located in such a way to prevent prevailing winds from blowing directly into the equipment intake. If the application is critical, provisions must be made to protect the equipment inlet from the driving winds.



INSTALLATION

CLEARANCE

Select the installation location and support system (curb, stand or other) that meets or exceeds all of the minimum safety clearance requirements.

BOTTOM

Equipment should be installed to allow clearance for proper condensate trap (if applicable). Also, the equipment is not to be installed on combustible surfaces.

SIDES

The minimum recommended clearance on all sides of the equipment except for the service side and bottom is 6 inches.

SERVICE

The service side should have a minimum of 24 inches of clearance; however it is recommended that the clearance be at least the width of the widest door.

Also, if the equipment includes any coils or has twin blowers more clearance should be provided for removal of those components.

The minimum clearances listed above are set, in place, by the standard in which Titan Air builds their equipment to meet; however, one should consult with all authorities having jurisdiction to ensure they don't require larger clearances. Furthermore, the equipment must be installed in such a way to facilitate smooth operation and maintenance of all built in sections and components. Also, it should be noted that the coil pull could be located on either side of the equipment. Review the equipment submittal drawing for the correct direction of the coil pull.

CURBING (OUTDOOR MOUNTING)

The use of a full perimeter curb or mounting rails under the heater is recommended. The only openings in the roof should be for the supply air duct, return air duct (if required), gas and electrical connections (if applicable). These openings must be sealed properly after installation. Titan Air ships all curbs unassembled and un-insulated. Installing contractor supplies gaskets, cant strips, insulation, etc. Height of the curb is specified when the equipment is purchased.

INSTALLATION SAFETY

RIGGING

- **DANGER:** Never enlarge lifting lug hole to accommodate larger anchor shackle.
- **WARNING:** Never assemble equipment sections or sub-assemblies together before rigging. Always rig equipment the way it was shipped from the factory.
- **CAUTION:** It is the installer's responsibility to confirm that the lifting equipment capacity exceeds equipment weight by an adequate safety factor. Never stack inlet hoods or other components onto the equipment **as the equipment is being lifted.**
- **IMPORTANT:** Apply appropriate sealant to roof curb and duct adapter(s) prior to setting the equipment in place (if applicable).

Lifting Requirements:

- Protect coil connections, extending through equipment casing, from damage by the rigging cables through the use of plywood or other suitable materials.



INSTALLATION

- Exercise care when moving the equipment.
- Rig the equipment using **ALL** the lifting points, in a fashion that holds it level and prevents it from tipping, falling and/ or twisting.
- Spreader bars of sufficient width **MUST** be used across the top of the equipment, to ensure that the lifting cables clear equipment cabinetry.
- Utilize the same rigging and lifting methods as the ones applied to the equipment, for lifting the accessories.
- Remove all wooden shipping blocks before setting equipment onto curb (If applicable).
- After sections are set in place, assemble according to Equipment Section Assembly. (If applicable)
 - NOTICE: Warranty does not cover damage from the equipment being severely twisted or dropped during handling.

DUCTWORK

Ductwork must be sized and installed in accordance with applicable codes and standards. As a recommendation follow SMACNA guides for proper ductwork design, size and installation. A size variation may exist from recommended duct size to equipment or accessory flange size. Accessories on the equipment intake or discharge may be larger than the openings on the equipment. Be sure to check the equipment submittal drawing for the correct equipment connection size. Recommended duct size applies to the size of the duct at the connection to the equipment. Factory also recommends 2 1/2 times the equivalent duct diameters of straight ductwork off the discharge outlet of the blower. A properly designed duct transition from the blower outlet to a larger duct is recommended for long ducts or ducts with numerous elbows. The equipment was designed for a specific CFM and ESP (External Static Pressure) stated on equipment rating plate. The ductwork attached to the equipment will significantly affect its performance.

On heaters mounted outdoors, discharge ductwork should be insulated to minimize condensation during the “off” cycle in cold weather. A fresh air intake hood with bird screen is required. Discharge ductwork on a twin blower equipment must be common to both blowers.

On a heater mounted indoors with through the roof intake, a “mushroom” type intake hood is recommended to prevent moisture entrainment. When using “through the wall” intake duct, the intake louver should have adequate moisture baffling characteristics. All intake ductwork exposed to the heated space should be insulated. Also any ductwork passing through unconditioned spaces must be insulated and covered with a vapor barrier.

SOUND AND VIBRATION CONTROL

Use of flex coupler between building ductwork and air makeup equipment is highly recommended. Vibration isolators that mount between the equipment and support structure are optional and can be supplied with the equipment for installation by others. Another option is internal isolation of the blower/motor assembly with internal flexible connections between the blower housing and the equipment structure.

Appropriate insulation on the interior of ductwork significantly reduces sound levels. Blower selection also plays a major role.

COIL INSTALLATION

WATER, STEAM, DX & AMMONIA

Visit <http://www.titan-air.com/> and click on “Tools & Resources” and then the “Technical” tab for more detailed installation and maintenance instructions.

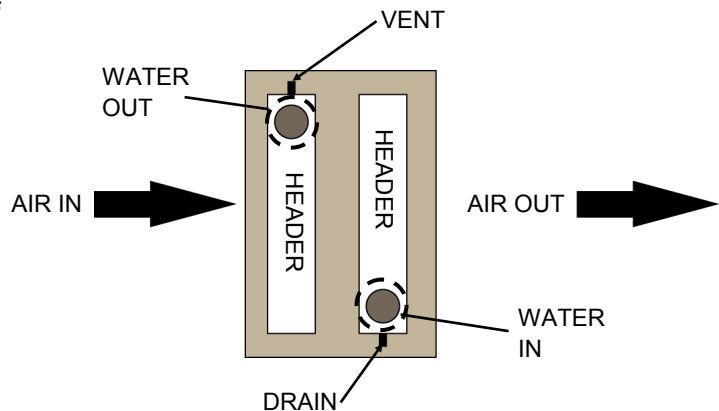
- **DESIGN REQUIREMENT:** Piping must be sized and installed in accordance with applicable codes and standards. Refer to equipment name plate for flow and pressure ratings.

Cooling coil piping must be properly insulated up to coil header (inside air handler) to prevent condensate from dripping outside of the drain pan. Utilize sealant between piping or coil stub and equipment casing before applying insulation. Some coils are equipped with multiple header connections to allow for universal airflow direction. Extra connections are capped in the field.

WATER, STEAM & AMMONIA

- **IMPORTANT:** Always use a backup wrench when attaching piping to coils with copper headers. Do not overtighten coil connections. Support coil piping independently of the coils. Swing joints or flexible fitting may be needed to avoid thermal expansion/contraction strains.
- **INSTALLATION CONSIDERATION:** Exercise caution when using Teflon tape or a piping compound not to overtighten the piping connections.

Piping should be equipped with shut-off valves and union fittings to facilitate coil removal. Water coil piping is typically arranged to provide counterflow operation (supply piping on lower, air leaving side of coil and return on upper, air entering side) See Diagram, on the right.



WATER COIL COUNTERFLOW DIAGRAM

Verify that equipment is installed level to allow for free draining. External vent and drain connections are recommended. When coils are drained, compressed air must be applied to the vent connection for a complete purge. Coils must be vented of air on initial start-up and each time the coil is re-filled. This can be accomplished manually, or a commercially available hydronic system air eliminator can be installed.

Water coils must be protected from freezing if cold outside air moves across the coil. Chilled water coils should be drained or use a suitable anti-freeze solution during cold weather. Additional steps can be taken to reduce likelihood of freezing a coil including:

1. Use a pre-heat coil with modulating valve forced fully open below a set outside air temperature. This is typically accompanied by a reheat coil or face & bypass dampers to provide supply air temperature control.
2. A coil loop pump to produce constant flow through the coil with modulation accomplished by varying the percentage of supply water and return water to the coil. Providing constant flow with variable temperature instead of variable flow through the coil reduces the opportunity for freeze-up.



INSTALLATION

3. Low leak intake dampers to prevent cold air from settling in the equipment during the off cycle.
4. Low temperature safety stat(s) to force the equipment to a “safe” condition if the temperature downstream of the first coil drops below a set point for a given amount of time. This safe condition typically involves shutting down the airflow and opening the modulating valves. If the valve control is provided by others and Titan Air supplies a freezestat, only the blower function will be limited by our freezestat. The field installer must ensure that the valve opens on loss of power, opens when the freezestat is tripped, and opens when needed during the off cycle to keep the cabinet warm enough to prevent freeze-up.

DISCHARGE TEMPERATURE SENSOR BULB INSTALLATION & WIRING

The installing contractor may be responsible for field installation of the discharge temperature sensor. Install discharge temp sensor at least five duct diameters away from the equipment discharge to provide ample mixing of tempered air. Field installation of the discharge temperature sensor in the discharge ductwork results in a better measurement of the average supply air temperature. ***Utilize shielded cable for field installed discharge sensor wiring.***

FIELD WIRING

Most equipment will require field wiring. Typically, field wiring is limited to power supply wiring, remote panel wiring, and intake or discharge damper wiring. Occasionally, additional sensor wiring may be required.

Carefully review the schematic and associated schematic symbol legend. Note that legend may be on the parts/legend sheet rather than on the schematic.

If an intake or discharge damper was ordered as a loose accessory, it will have to be mounted as specified in the Damper Installation Instructions found on page 22 and the actuator must be wired. The remote panel must be mounted in a convenient location and wired to the equipment. Interlocks between the exhaust, equipment and possibly spray booth will have to be connected by field wiring.

Low voltage wiring (terminals 100+) must be run in separate conduit or in shielded cables to prevent noise from affecting the control signals. Additionally, good practice calls for all DC voltage (sensor and control signals) to be shielded or run separate from 24 VAC control wiring.

Typically, remote control panel wiring will sourced from a listed Class 2 transformer. Therefore, most installations can take advantage of the opportunity to utilize less expensive wiring methods documented in NEC Article 725.

Communication wiring (for DDC control systems) should be wired per DDC manufacturer's recommendations.

- NOTE: All field wiring must conform to N.E.C. and/or any state or local codes.

POST INSTALLATION

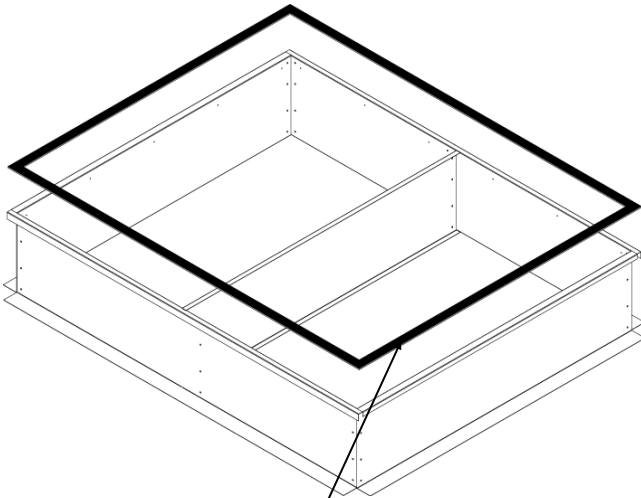
Most of the equipment will likely be under a negative pressure when the blower is operating. Dirt and moisture can be drawn into the equipment. Check for water in outdoor equipment after operation during a rain shower. Sealing integrity should be rechecked on a yearly basis.

- NOTICE: Water damaged parts are not covered by Titan Air's warranty

Horizontal Unit-Supporting Options Curb

Curbs are to be assembled in the field.

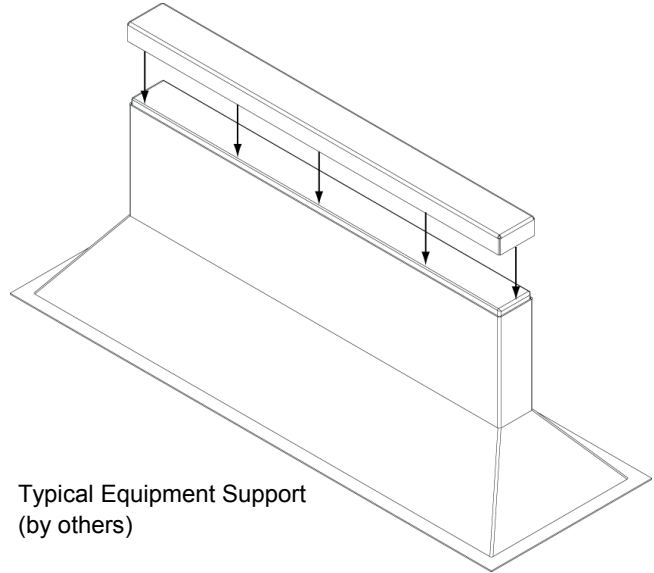
Assemble according to the letters marked on the top of each curb piece using factory supplied fasteners.



Caulking or Gasket material
(supplied by others)

Accessory- Horizontal Unit Supporting Options

Recommended option for supporting accessories on a flat roof:



Typical Equipment Support
(by others)

Other method of installation using sheet metal support legs.

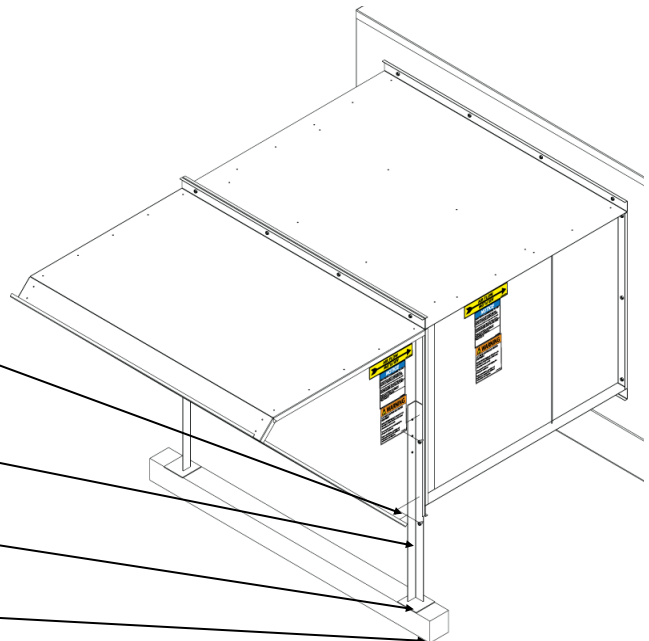
- **IMPORTANT:** Not recommended for any unit larger than 125 model.

Attach support brace to accessory seam using field supplied fasteners.

Bent, 16 gauge (if supplied by factory), sheet metal support brace.

6 X 6 inch sheet metal pad welded to the support brace (if supplied by factory)

Wood Block (supplied by others)



MULTI-SECTION EQUIPMENT

Horizontal Configuration

Before beginning:

Be sure to check the tightness of all bolts, nuts and setscrews, which could have loosened during shipping.

Rotate blower fan shaft(s) by hand to make certain there is no interference or rubbing between components.

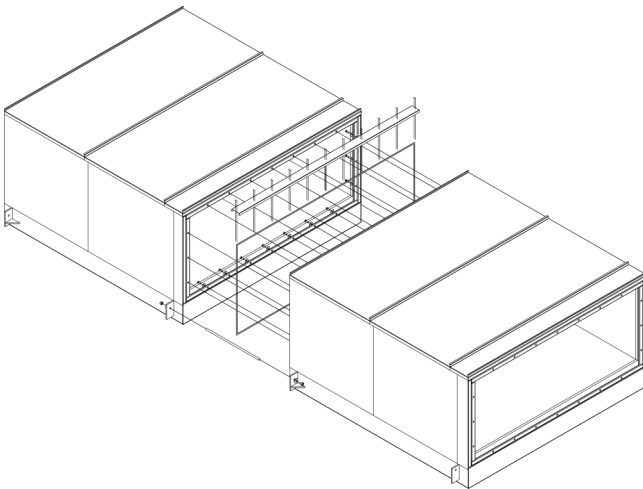
Verify installation surface is level before proceeding with unit installation.

Locate mounting hardware:

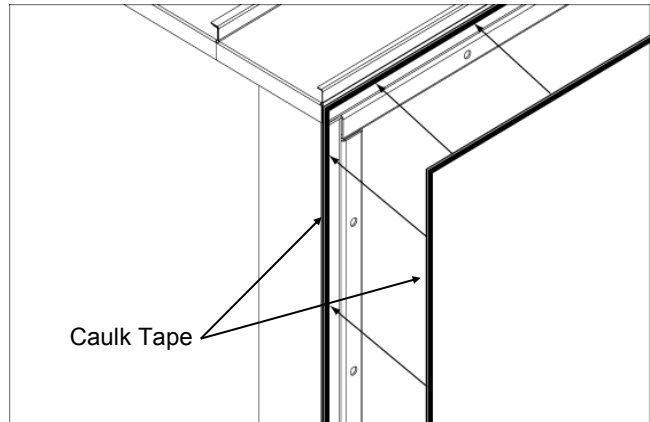
Items included: Caulk, Caulk Tape, Fasteners

Check all sections, of the unit, thoroughly for assembly hardware. The assembly hardware will be found packaged in either a clear plastic bag or corrugated box.

- NOTICE: There may be more than one package of assembly materials provided.



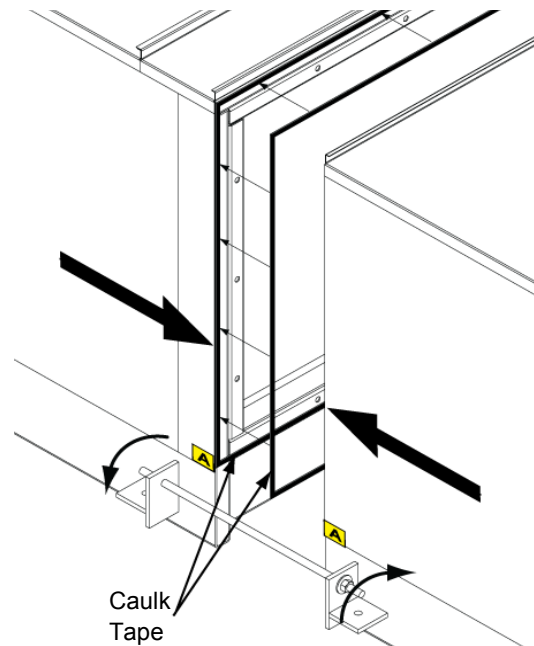
1. Apply provided caulk tape to the face of the joint to be bolted together, on one side only as shown below, before assembly. Ensure there are no gaps in the caulk tape when applying. **Do not** cover bolt holes with caulk tape.



2. Locate and match each section letter on the service side of the unit with the corresponding letter on the other section. In addition, also refer to the unit submittal drawing for proper assembly order.



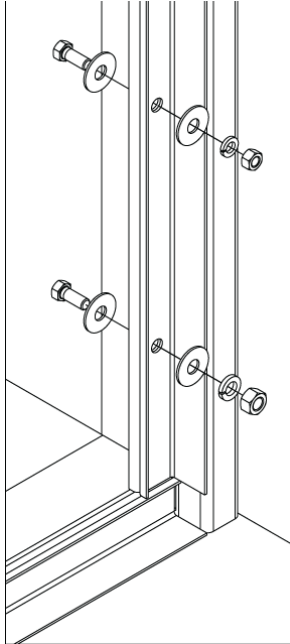
3. Pull sections together at the lifting lugs using, two, half inch rods w/ nuts and large washers as shown below.



4. Use the provided fasteners to secure the seam at the top and bottom before setting the next section into place.

- **IMPORTANT:** Use all of the bolt holes in the seam for joining the unit sections together and then tighten accordingly.

Trim off the excess caulk tape squeezed out of the joint at each unit joint to provide a clean appearance.



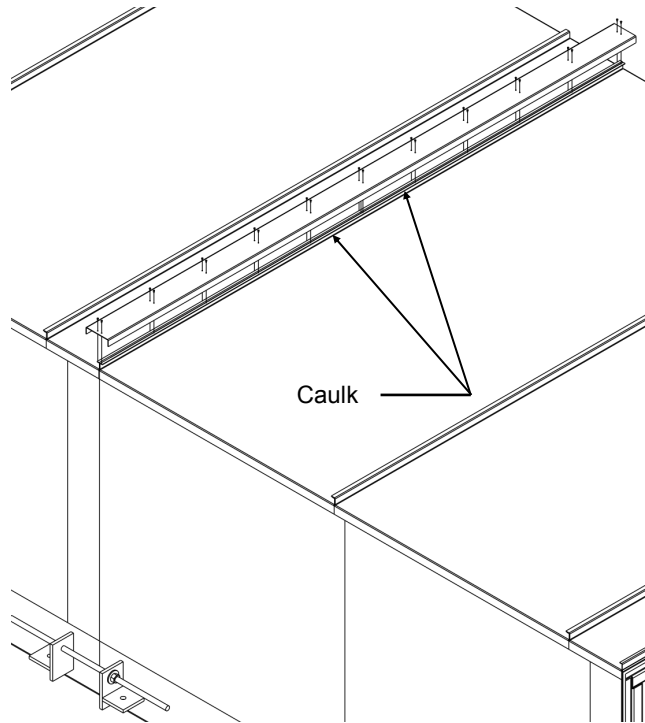
5. After all of the sections are bolted together, caulk the external section seam(s) to provide a water tight seal.

- **IMPORTANT:** Check all external sheet metal seams for caulk shrinkage and re-caulk if necessary. *Titan Air Inc. does not warranty water damage equipment.* Unit seam sealing integrity should be rechecked on a yearly basis.
- **NOTICE:** Access door swings **MUST** be kept free of installation piping and wiring to allow for service and maintenance.

6. Roof Cap Installation

Apply caulk to section roof tee before placing on the splice cap.

Fasten splice cap to roof tee using the provided self tapping screws from the top.



MULTI-SECTION EQUIPMENT

Vertical Configuration

Before beginning:

Be sure to check the tightness of all bolts, nuts and setscrews, which could have loosened during shipping.

Rotate blower fan shafts by hand to make certain there is no interference or rubbing between components.

Verify installation surface is level before proceeding with unit installation.

Locate mounting hardware:

Items included: Caulk, Caulk Tape, Fasteners

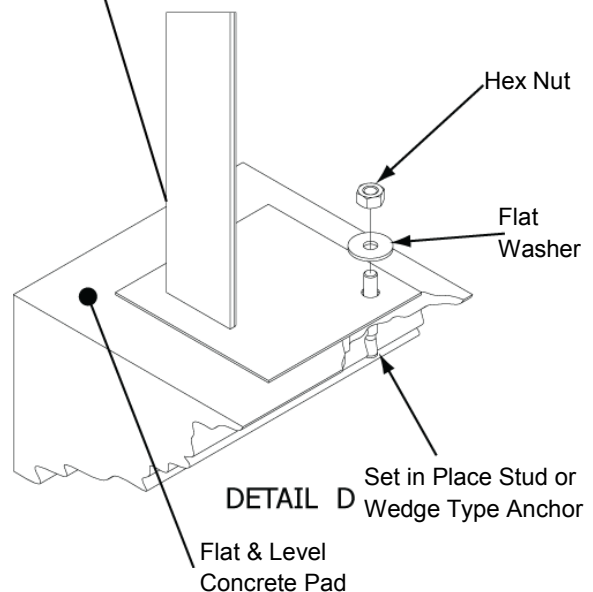
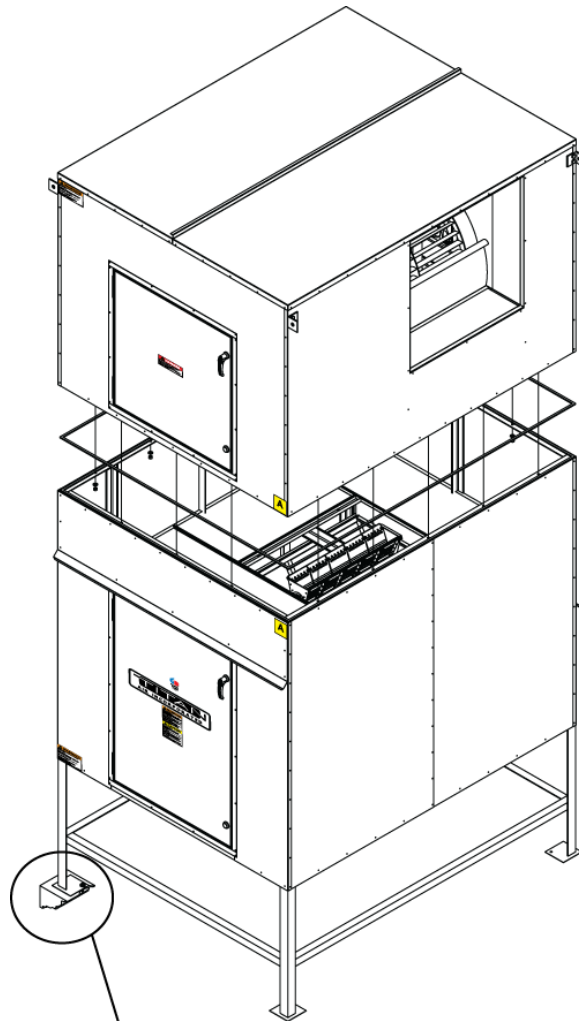
Field Supplied Hardware: Anchoring studs along with nuts and washers

Check all sections, of the unit, thoroughly for assembly hardware. The assembly hardware will be found packaged in either a clear plastic bag or corrugated box.

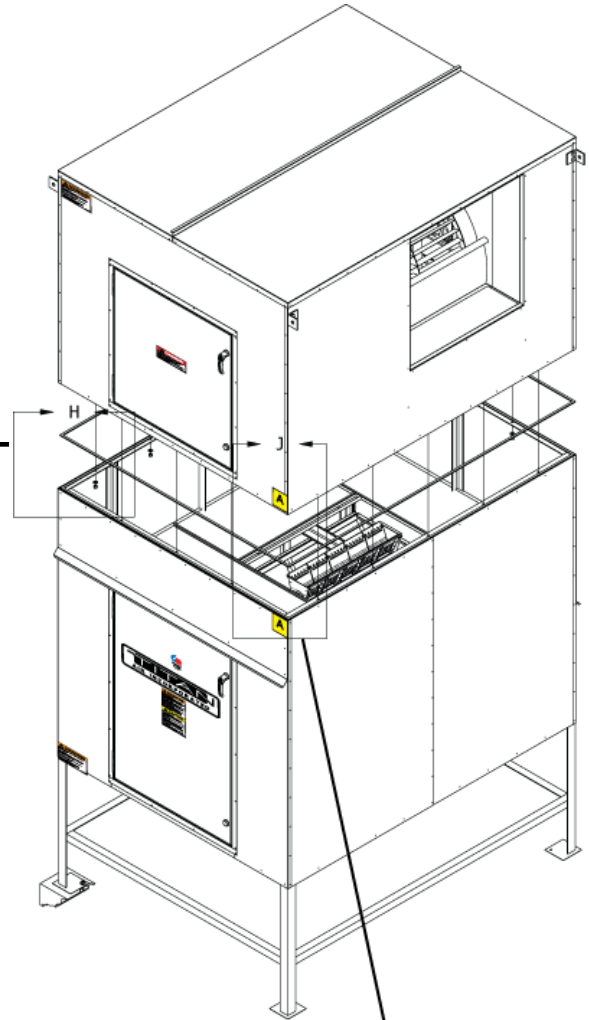
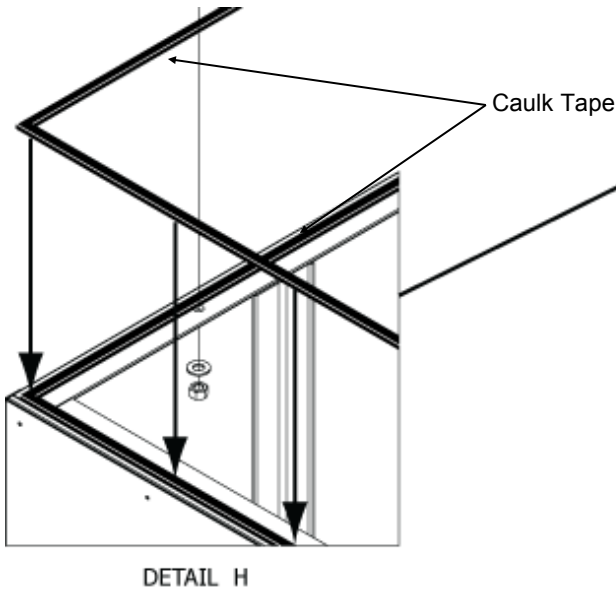
- NOTICE: There may be more than one package of assembly materials provided.

1. Anchor the stand on a level concrete pad using studs or by other means. Each stand foot pad needs to be secured.

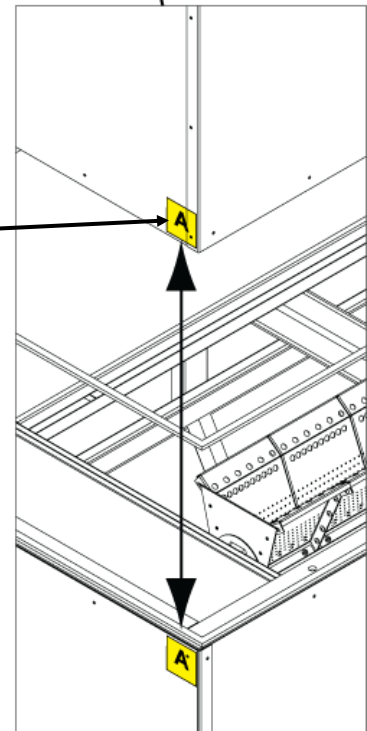
- NOTICE: For indoor equipment, the stand must be enclosed (sometimes height is increased.) A transition (by others) must be made from enclosed stand intake opening to the intake damper or louver (a size variation may exist.)



2. Apply provided caulk tape to one side of the joint to be assembled. Apply tape toward the outside of the bolt pattern as seen below. Ensure there are no gaps in the caulk tape when applying. **Do not** cover the bolt holes with caulk tape.



3. Locate and match each section letter on the service side of the unit with the corresponding letter on the other section. In addition, also refer to the unit submittal drawing for proper assembly order.

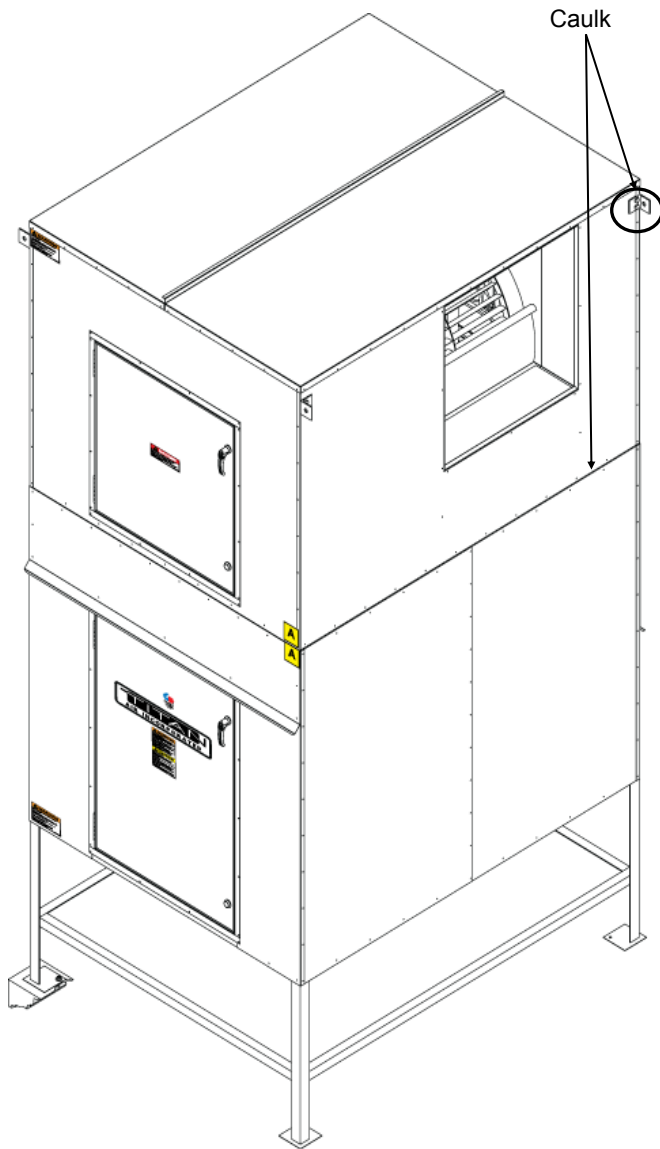


4. Lift blower section and center it over burner section with the unit section letters lined up. After blower section is set in place use drift punches to line up seam bolt patterns. Fasten sections together using the provided bolts, nuts and washers filling all of the seam holes.

DETAIL J

5. Caulk around the outside of each section seam.

- **IMPORTANT:** Re-caulk unit lifting lugs after assembly. Check all external sheet metal seams for caulk shrinkage and re-caulk if necessary. *Titan Air Inc. does not warranty water damage equipment.* Unit seam sealing integrity should be rechecked on a yearly basis.

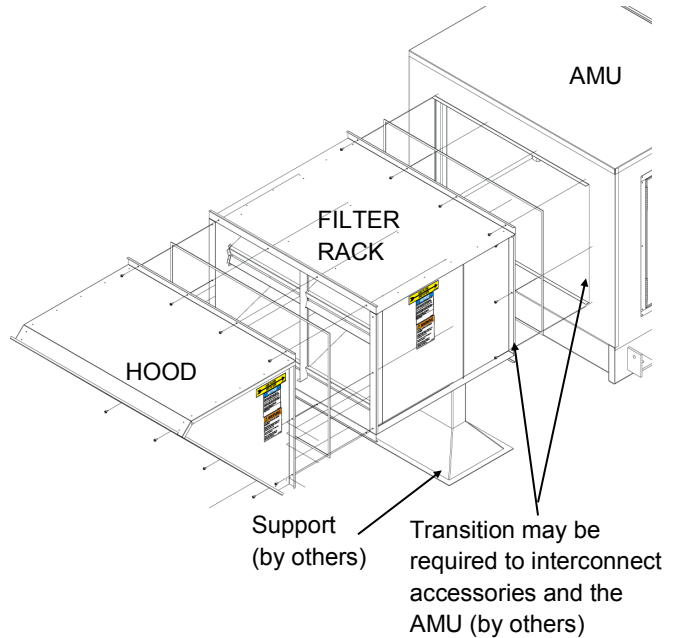


Accessory Installation

NOTICE: Unit accessories may be larger than unit intake and discharge opening or flanges. Due to infinite installation possibilities, a section of ductwork or transition may be required for proper accessory mounting (by others).

IMPORTANT: Installer **MUST SUPPORT** accessory items from a rigid point or points to ensure solid mounting using field or factory supplied hardware.

DESIGN CONSIDERATION: Titan Air strongly recommends using a flex coupler between the AMU and Ductwork.



Refer to Field Wiring section, under the installation section, for instructions on wiring the damper actuators.

Design Requirement: If an intake hood is supplied by others, the design shall minimize entry of snow/ rain and include an intake screen to meet ANSI standards.

Accessories on large equipment may be shipped in two pieces for field assembly. As a result, two damper actuators may need to be field wired.

Horizontal Unit

Before beginning:

Verify with roofing manufacture the method of installation preferred for supporting accessories (Rooftop Equipment Only).

Locate assembly supplies:

Items included: Caulk, Support Brackets (optional)

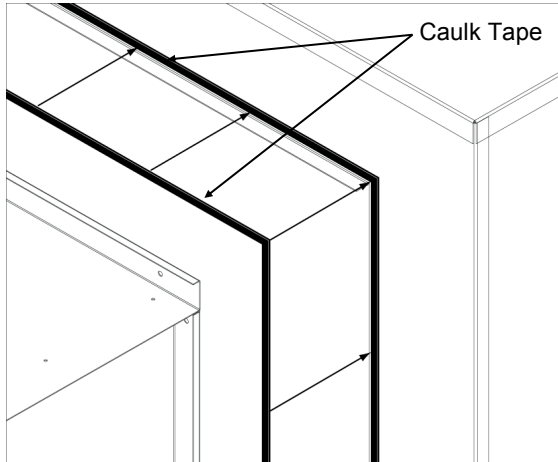
Field supplied hardware:

Caulk, Caulk Tape, Fasteners (Self tapping screws and ¼ inch bolts/ nuts/ washers)

1. Match serial number on the accessory to unit name plate inside control vestibule door.
2. Check unit submittal drawings to verify if unit accessories need a transition to match up with the air handler unit intake or discharge opening.

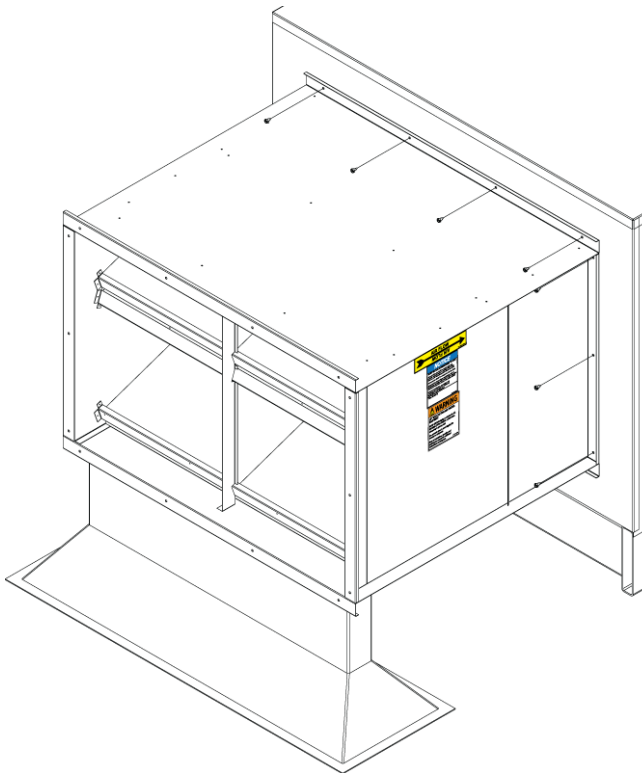
<h2>NOTICE</h2>
<p>MUST MATCH ACCESSORIES TO UNIT</p> <p>Accessories are built to match and may contain construction or wiring differences that are not interchangeable between units.</p> <p>Accessories MUST be supported in the field.</p> <p>Accessories larger than unit intake and/ or discharge opening will require a field supplied ductwork transition unless otherwise stated.</p> <p>Refer to installation, operation and maintenance manual for additional instructions and diagrams.</p>
<p>Titan Serial #:</p>
1-14-101-02 (03/13)

3. Apply caulk tape (field supplied) directly to the flange, below the screw pattern of the joint to be fastened together.

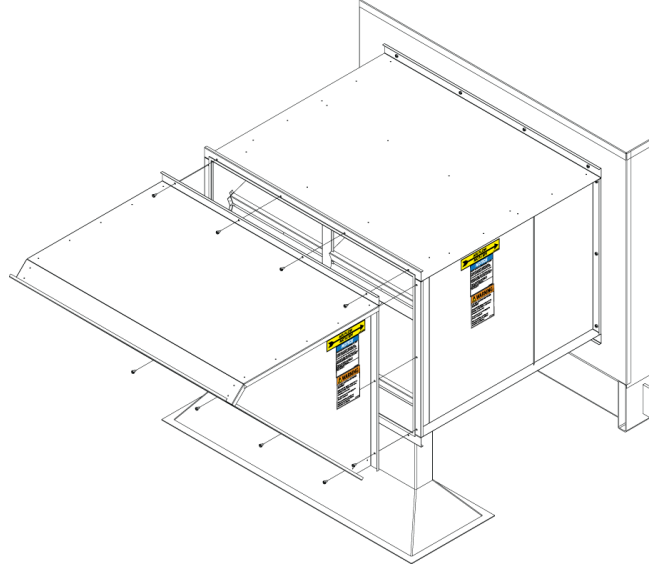


4. Hoist accessory using all lifting lugs, if provided; otherwise, a sling, to lift accessory and center it over the panel opening.

5. Affix the accessory to the unit using (field supplied) self tapping screws. Make certain every pre-punched hole in the flange is used in fastening.

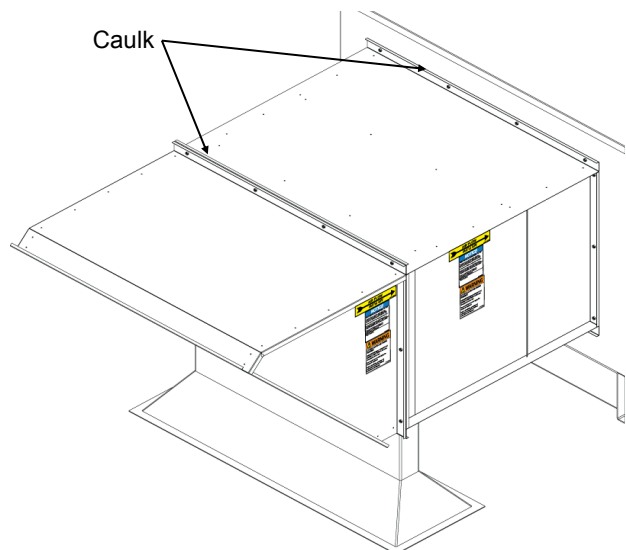


6. Repeat steps three through five to attach the hood to the filter section; *except in step five substitute 1/4 inch bolts in for self tapping screws to attach the hood to the filter section.*



7. After all of the accessories are installed, caulk each seam to provide a water tight seal.

- **IMPORTANT:** Re-caulk accessory lifting lugs after assembly (if applicable). Check all external sheet metal seams for caulk shrinkage and re-caulk if necessary. *Titan Air Inc. does not warranty water damage equipment.* Seam sealing integrity should be rechecked on a yearly basis.
- **NOTICE:** Access door swings **MUST** be kept free of installation piping and wiring to allow for service and maintenance.

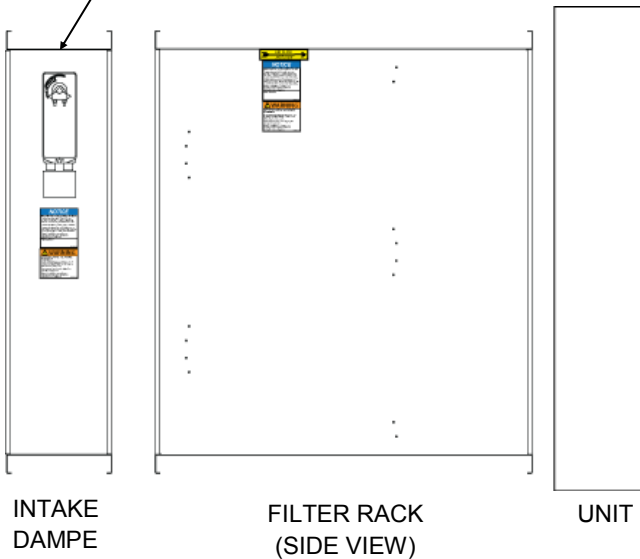


Intake Damper Mounting

Follow the Horizontal Accessory Installation instructions for proper installation and the diagrams below for mounting location of the intake damper.

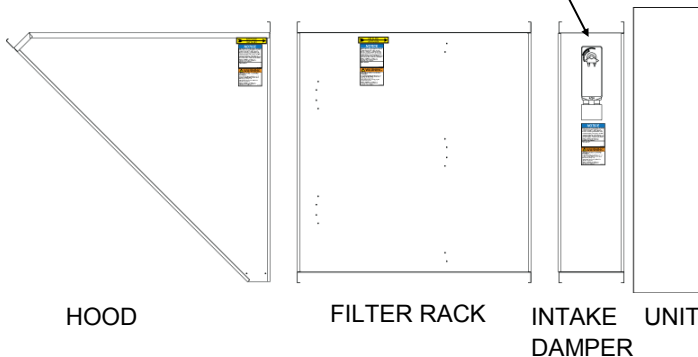
Indoor Installation Location:

IMPORTANT: Intake damper should be mounted at the building wall or ceiling.



Outdoor Installation Location:

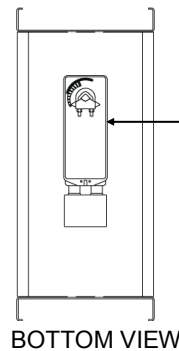
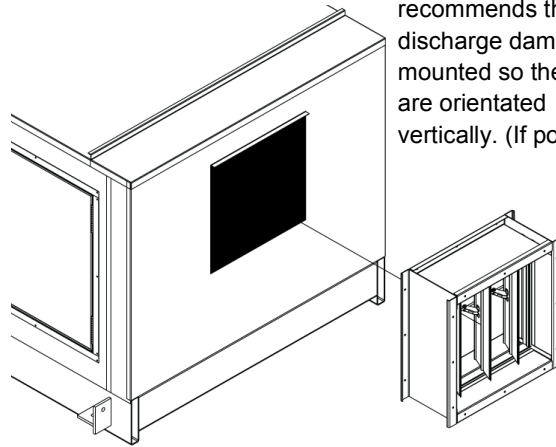
IMPORTANT: Titan Air recommends the intake damper be mounted with the damper actuator facing the service side of the unit. Make certain the damper actuator is **PROTECTED** from the outdoor elements with a sheet metal cover.



Discharge Damper Mounting

Follow the Horizontal Accessory Installation instructions for proper installation and the diagram below for mounting location of the discharge damper.

NOTICE: If the Discharge Damper is being mounted within two to three duct diameters from the unit discharge opening Titan Air highly recommends the discharge damper be mounted so the blades are orientated vertically. (If possible)

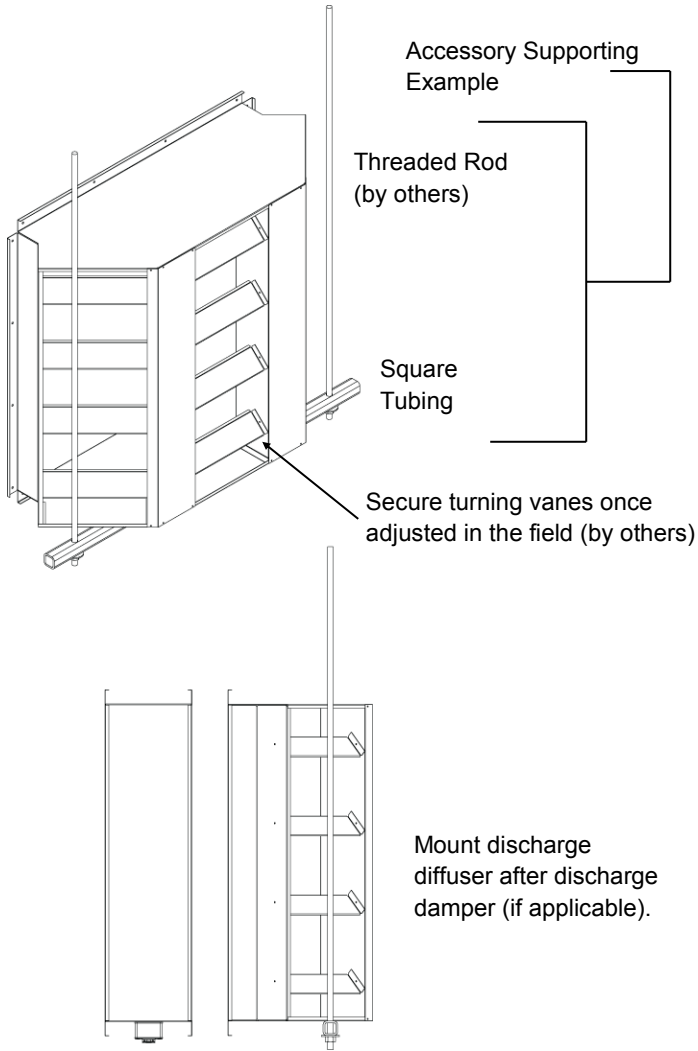


IMPORTANT: Titan Air also highly recommends the discharge damper be mounted at the wall or ceiling indoors. However, if the damper cannot be mounted indoors the damper actuator **MUST BE PROTECTED** from the outdoor elements (if applicable).

Vertical Unit Discharge Diffuser Mounting and Supporting

Ductwork between AMU and diffuser or discharge damper and diffuser is supplied by others.

Support diffuser at two points using field supplied materials (See example below).





STEAM COIL-TRAPPING

Steam coil condensate connections require specialized trapping practices. Properly trained technicians must be employed to ensure these requirements are met.

DRAIN PAN-TRAPPING

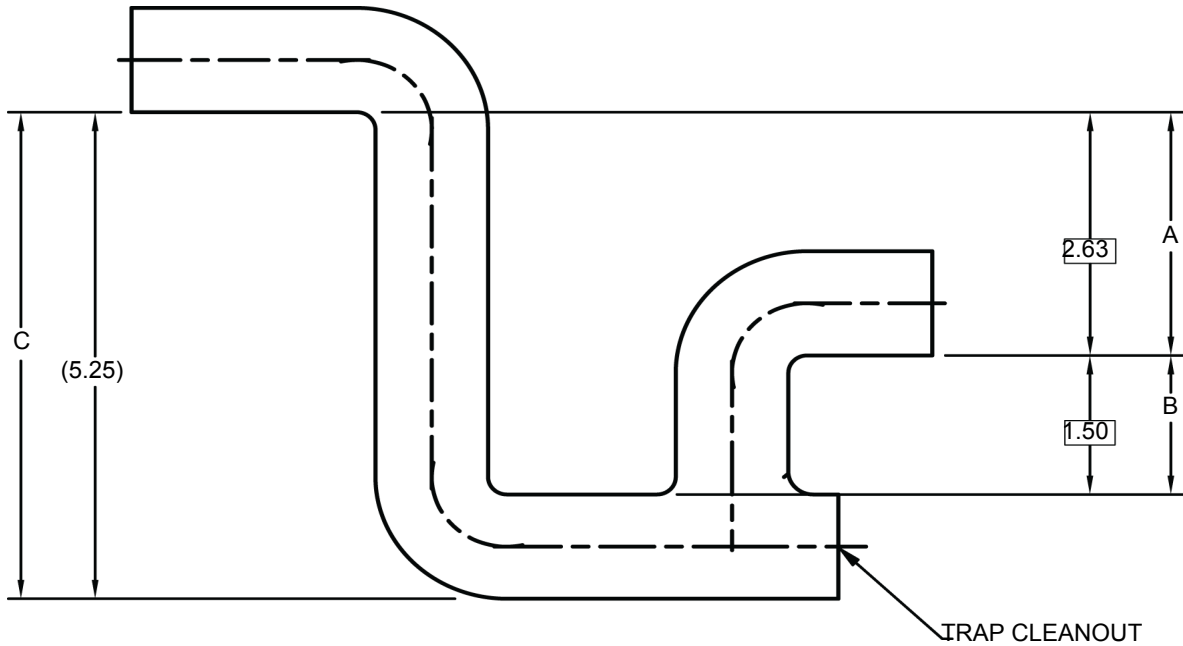
MATERIALS RECOMMENDED:

- (Use the same or larger diameter than unit connection): Copper, Galvanized, Black iron or PVC piping. (NOTE: Titan Air provides a male NPT pipe connection ranging from ¾ inch up to 1 ½ diameter, depending on application, on every drain pan.)

PROCEDURE:

- **IMPORTANT:** Do not combine more than one drain pan per trap. In cold climates the P-traps need to be protected against freeze-up.
 - **NOTICE:** Install the trapped drain line in accordance with all applicable codes.
 - **IMPORTANT:** Positive and negative pressure P-traps follow a similar concept; however they are not interchangeable. Traps need to be properly sized for the static pressure within the air handler cabinet.
1. First determine whether the drain pan is under negative or positive pressure.
 - **DESIGN CONSIDERATION:** Calculate static pressure at the drain pan for worst case scenario.
 2. Refer to the diagrams on the next page, utilizing the information gathered from the step before, to calculate the proper sized P-trap needed.
 3. If the drain line is installed downstream from an external trap, slope the line away from the unit at 1/8 inch per foot of run.
 4. Condensate disposal options:
 - Disposal of condensate directly onto the roof may be acceptable in certain areas, refer to local codes.
 - ◆ **IMPORTANT:** If condensate is to be drained directly onto the roof a small drip pad should in place to protect the roof from damage.
 - Another option for condensate disposal is for it to be piped into the building drainage system. Criteria to meet:
 - ◆ Pipe should penetrate the roof external to the unit.
 - ◆ Installer still needs to include a P-trap whether it is installed inside or outside the building.
 - ◆ A vacuum break or vent should be provided, after the trap, on longer runs of drain line to ensure smooth flow of water.

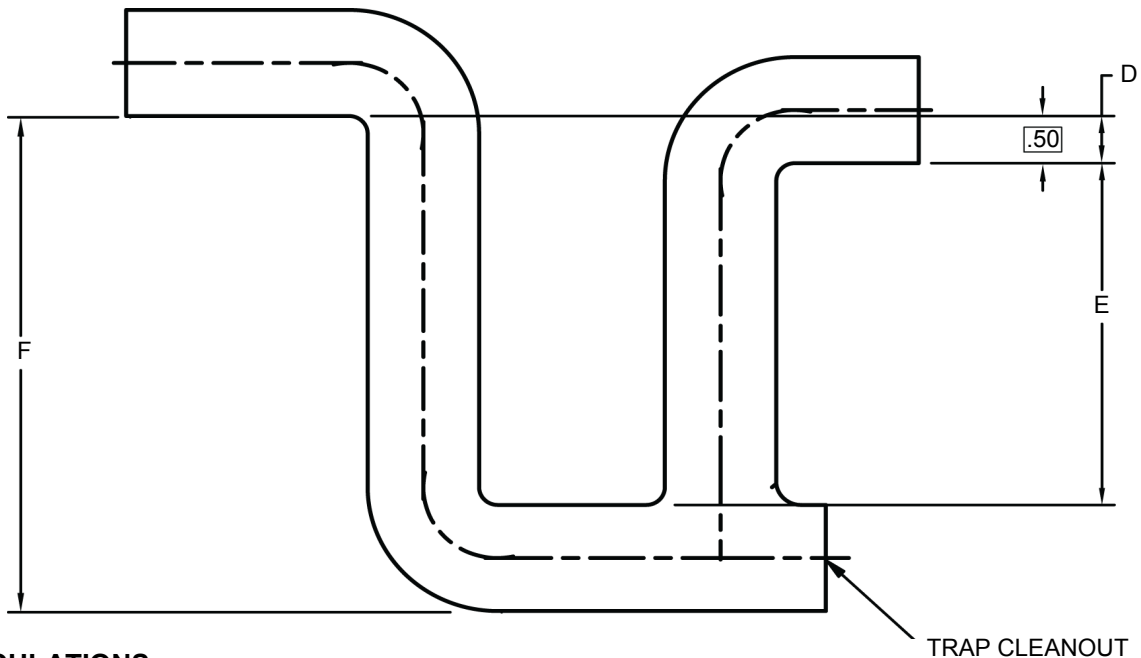
NEGATIVE PRESSURE P-TRAP



CALCULATIONS:

- $A = \text{Total Static Pressure (inches wg)} + 1 \text{ inch wg}$
- $B = A * .5$
- $C = A + B + \text{Pipe Diameter (inches)} + \text{Insulation (if applicable)}$

POSITIVE PRESSURE P-TRAP



CALCULATIONS:

- $D = \text{Minimum } 1/2 \text{ inch}$
- $E = 1/2 \text{ inch} + \text{Maximum Total Static Pressure}$
- $F = D + E + \text{Pipe Diameter (inches)} + \text{Insulation (if applicable)}$



GENERAL MAINTENANCE

Visit <http://www.titan-air.com/> and click on "Tools & Resources" for more detailed maintenance information.

As with any equipment or machinery, a maintenance program should be implemented.

Equipment maintenance should include the following:

1. Check filters and clean or replace as needed.
2. Check burner.
3. Check belts, belt tension and sheave alignment. (Do not over tension.)
4. Confirm smooth operation of dampers.
5. Lube bearings.
6. Check all hardware (bearings, etc.) for tightness.
7. Check settings for all controls.
8. Check duct connections for leaks.
9. Check piping for leaks.
10. Inspect heating or cooling coils, on a monthly basis, and clean if necessary.
11. Clean condensate traps and replenish drain pan with anti-microbial treatment (winterize traps seasonally).
12. Re-caulk seams if needed.
13. Go through complete start-up procedure (once per year).

FILTERS

Dirty or clogged filters will restrict air flow which in turn affects the equipment performance. Therefore, it is necessary to check filters on a regular basis. Several standard filter types are available including 2" pleated 30% efficient, 2" disposable fiberglass, 2" linked panel, and 1" or 2" cleanable filters.

Cleanable filters should be removed from the filter rack and sprayed with a low pressure water. Always spray these filters in the opposite direction to air flow and apply new coating to filters when dry.

Note that cleanable filters alone may not adequately protect a coil from dust and dirt accumulation.

Filters in an unheated outdoor airstream can "freeze-up" when the humidity is high (foggy) and temperatures are near freezing.

Method of Prevention:

Install pre-filters in the outdoor airstream that can be removed during such weather.

BURNER

Refer to Heatco instruction manual for specific instructions on how to care for the indirect fired burner and heat exchanger.

GENERAL V-BELT DRIVE TIPS

Refer to website for more detailed information pertaining to belt maintenance.

- Keep the belts and sheaves free from foreign materials that may cause slippage or damage to the belt and sheave surfaces.
- Maintain sheave alignment.
- Inspect the V-belt drive periodically. Re-tension the drive belts if they are slipping.
 - ◆ NOTE: Optimal belt tension is the lowest tension at which the belts will not slip under peak load. Peak load typically occurs at start-up.
- Over tensioning belts can cause premature bearing, sheave and belt failure.
- Particular attention should be given to these conditions:
 - Worn groove sidewalls
 - Shiny sheave groove bottom
 - Wobbling sheaves
 - Damaged sheaves

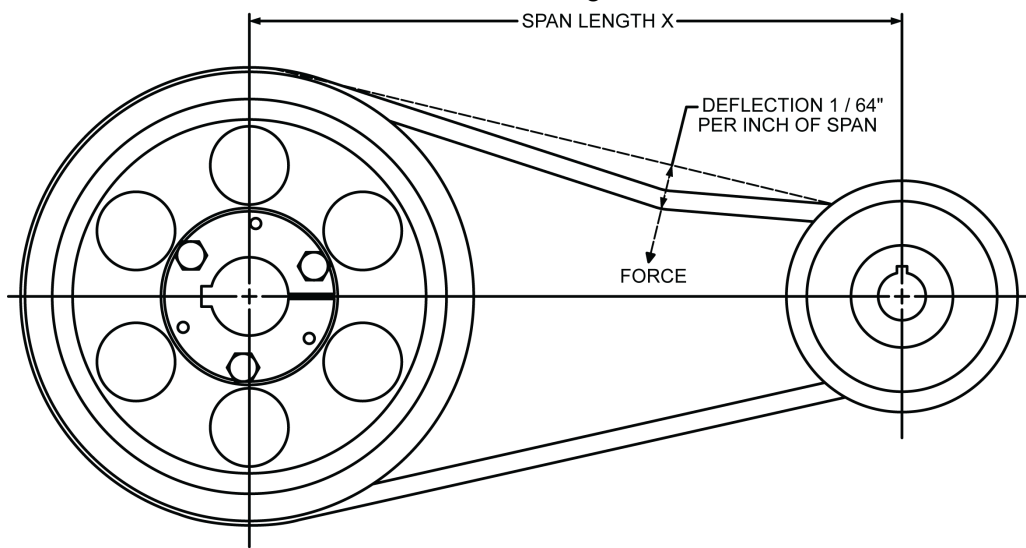
BELT TENSION

Proper sheave alignment and belt tension are critical to belt and bearing service life. Incorrect belt tension or misalignment of sheaves can cause any of the following:

- Premature failure of bearings.
- Premature failure of belts.
- Reduced air volume.
- Noise and vibrations.

Each Titan Air unit has as standard equipment an adjustable motor base. To adjust the belt tension, loosen the motor hold down bolts and adjust the slide base with adjusting bolt(s) on the end of the base (larger bases will have 2 adjustment bolts). Use a belt tension tester and associated tables to determine proper tension. Re-tension after the first day of operation with new belts and periodically thereafter.

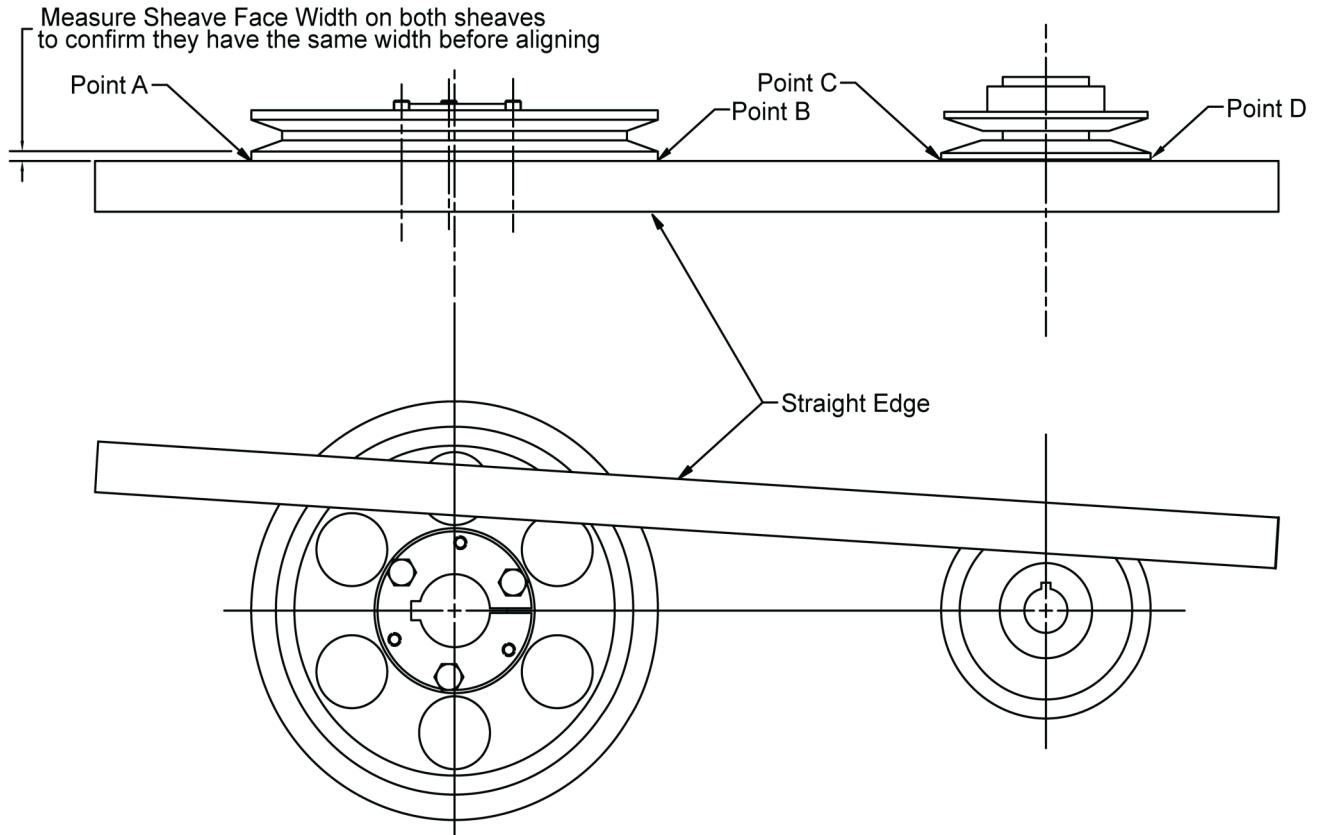
Common belt tension gauges will specify a force required to produce a deflection of 1/64" per inch of span. The force required to achieve this deflection is typically in the range of 3 lbs for A-belts, 5 lbs. for B-belts, and 15 lbs. for 5V belts. See Figure below.



SHEAVE ALIGNMENT

With the use of a straight edge, sheave alignment can be checked quickly and accurately. One of the sheaves will have to be loose on its shaft in order to make adjustment. Adjust until all 4 points are in contact with the straight edge (see Figure below). Repeat on the other side of sheaves and then re-tighten.

If a face width variation exists, measure the difference between each side of the narrowest sheave and adjust until both sides are an equal distance from the straight edge.



BELT REPLACEMENT CONSIDERATIONS

- **IMPORTANT:** Do not force belts onto sheaves by using a pry bar or by rolling the sheaves.
- **NOTICE:** Match the size of the new belts to existing ones, except if the sheave groove size was adjusted. Replace drive belts in complete sets. Purchase set of belts from the same manufacture.



MAINTENANCE

BLOWER BEARINGS

Bearings must be checked during each periodic maintenance inspection. Bolts and set screws should be checked for tightness and the bearings may need lubrication. *Refer to website for specific manufacturer cut sheets pertaining to bearing maintenance.*

Bearing Lubricate: Any good quality lithium or lithium complex base grease using mineral oil conforming to NLGI grade 2 consistency and an oil viscosity of 455-1135 SUS at 100°F (100-250 cSt at 40°C) may be used for re-lubrication.(Only applicable if unit blower bearings are Browning AH (Air Handler))

- **IMPORTANT:** The following table is intended only as a guide to aid you in setting up your own schedule.

LUBRICATION GUIDE FOR BLOWER BEARINGS

Operating Conditions	Bearing Temp. (°F)	Grease Interval
Clean	32 – 120	6 – 10 ,months
	120 – 150	1 – 3 months
	150 – 200	1 – 4 weeks
Dirty	32 – 150	1 – 4 weeks
	150 – 200	Daily – 1 week
Moisture	32 - 200	Daily – 1 week

MOTOR BEARINGS

Motor bearings in a clean environment should be lubricated every 2 to 3 years. Under more severe conditions of dirt or moisture, lubrication may be required every 6 months to 1 year. *Refer to website for specific manufacturer cut sheets pertaining to motor bearing maintenance.*

Typical motor bearing lubrication procedure follows:

1. Remove fill and drain plugs.
2. Clean drain port of hard grease (with wire if necessary).
3. Add grease (cavity should be no more than ½ full.).
4. Start motor and let run for 10 minutes.
5. Wipe off any drained grease and replace fill and drain plugs.

- **IMPORTANT:** Avoid adding an excessive amount of grease since this a common cause of motor failure.

BLOWER WHEEL

Ensure that blower hub is securely fastened to shaft. Inspect blower wheel and blades for signs of damage or cracks. Clean blades if necessary to maintain proper balance and performance. Avoid use of excessive grease on blower bearings that can coat fan blades and attract dirt.



PLATE FINNED COIL CLEANING

Dirty coils will reduce heating and/or cooling capacity and restrict airflow. All finned coils will require cleaning. The cleaning frequency will depend upon the cleanliness of the airstream.

- **IMPORTANT:** Exercise care when cleaning the coil as not to bend the fins.

Use a high powered vacuum, compressed air, non metallic brush applied in the direction of the fins or a mild soap and water solution to clean the coil. Specialty coil cleaning products are available. Cleaning the header and return bends with soap and water will also provide an initial check for pinholes or cracks that may not be visible. Refrigerant leak detectors should be utilized for DX coils.

- **NOTICE:** Corrosion or deposits on copper or brazed joints may indicate corrosive chemicals in the airstream. Baked phenolic coatings should be considered if corrosive chemicals are present.

CONDENSATE DRAIN PAN CLEANING

The drain pan should be cleaned on a periodic basis, to prevent microbial growth, by a qualified service technician.

CONDENSATE TRAP

Winter: Drain water from P-trap(s) during cold months or protect it from freezing. Fill the trap with mineral oil to maintain air seal.

Summer: Prime trap with water before starting up a unit if the coil produces condensate, otherwise fill the trap with mineral oil.



GENERAL START-UP INFORMATION

Even though Titan Air equipment is tested prior to leaving the factory, a complete field start-up is essential to proper operation of the equipment. Qualified individuals should perform installation, start-up, and maintenance tasks.

Remote panel wiring must be tested and heating or cooling capacities should be verified. Interconnection with associated equipment must also be verified (exhaust fans, boilers, chillers, condensing equipment, valves, ...).

Every components function should be verified during start-up. The start-up procedure is a good starting point for this check-out. As the start-up states, once initial operating checks have been accomplished, proper operation per the sequence of operation must be verified. Apparent malfunction of a component may be caused by improper supply conditions, field wiring errors, or other problems unrelated to the component which is apparently malfunctioning. Titan Air's experience has shown that more than half of all returned components are in full operational condition. Please fully inspect possible causes of improper operation prior to ordering parts.

SUGGESTED TOOLS AND INSTRUMENTS NEEDED FOR START-UP:

- Volt/Ohm Meter
- Ammeter
- Tachometer (preferably non-contact style)
- Thermometer (preferably digital with remote probes and sufficient lead lengths)
- Gas pressure gauge (-10" to 0 to +10" of water column typical scale)
- Manometer (for checking external static pressure)
- Combustion Analyzer
- Standard Hand Tools

Additional items for temperature controls using Digital Programmable Controller:

- 1,070 Ohm resistor (supplied)